Missouri Department of Natural Resources
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Technical Guidance for Inspection of Water Storage by Divers

Water Protection Program technical bulletin 4/2004

Many firms offer the service of inspecting finished water storage facilities using divers. The Public Drinking Water Program does not have specific rules governing the methods for cleaning or inspecting water storage tanks. It is the responsibility of the public water system to ensure that any such activities result in competent supervision and operation so that the quality of water being dispensed is safe and meets the requirements of rules 10 CSR 60-1.010 through 10 CSR 60-16.030. If repairs to a storage facility are necessary, State Rule 10 CSR 60-4.080(6) requires public water systems to disinfect every newly repaired finished water storage facility by methods acceptable to the Missouri Department of Natural Resources before being returned to service. However, repairs that do not have the potential of impacting the water quality in the tank would not require storage facility disinfection. If you have questions, please contact your nearest Regional Office. To find the Regional Office nearest you look at the map at the following Web site (http://www.dnr.state.mo.us/shared/regions.htm) or call 1-800-361-4827 for information.

The following information is given for guidance only.

General

Only experienced qualified firms that are willing to explain their disinfection and diver safety procedures should be used. Also, only those firms that will follow the American National Standards Institute / American Water Works Association (ANSI/AWWA) disinfection standards should be used. The Program recommends using only commercial divers that wear dry suits and are trained in water storage cleaning and inspection. The dry suit and diver's helmet must fully encapsulate (no exposed skin) the diver and the suits and other equipment must be dedicated to use only in potable water. In addition, the diver's suits and all equipment and materials used in the tank during inspection should be disinfected with a 200 mg/l chlorine solution as per AWWA's C652-92 standard. Adequate diver safety procedures must be provided in order to avoid diver injury or death.

Any firm should be willing to provide inspection checklists or copies of reports that show they can and will inspect for sanitary defects and structural damage as well as paint conditions. In the event that significant structural defects are identified the public water system officials should consult with a Missouri registered professional engineer to further evaluate the inspector's findings and recommendations. The state's most serious water storage inspection issue is inspections that fail to reveal major sanitary defects in storage facilities. See the technical bulletin *Microbial Contamination of Water Storage Tanks* (pub172) for more information. Disease out breaks have been caused by birds, bats, bees, wasps and unidentifiable animals contaminating water in storage. Therefore, any inspection firm must have inspectors trained to

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recognize improperly maintained or constructed vents, overflows, roof hatches and so forth. Furthermore, inspectors must be capable of inspecting all of the different safety devices installed on storage facilities and be familiar with safety standards.

The contract between an inspection firm and the system should clearly state what work, equipment, material and services must be provided by the system and the inspection firm. It should also describe the extent of the inspection. For example, some firms do not inspect tank exteriors. Some firms inspect only the bowl of elevated water tanks and will inspect the wet riser only if specifically requested to do so. In addition, if any touch up paint is used, it must be approved by the National Sanitation Foundation (NSF) for use in potable water.

All inspection firms should provide video tapes or pictures of the facility and written reports describing all conditions discovered during the inspection and not just the deficiencies found. Any sanitary defects found should be explained at the time of the inspection so the facility owner can have them corrected immediately.

Responsibility

The inspector should assume the entire responsibility for accident to himself and his employees while inspecting the structure. He should carry adequate workman's compensation and property-damage insurance and shall fully protect the owner against claims of any nature arising out of the inspection work.

Storage-Facility Isolation

The American National Standards Institute / American Water Works Association standard for Disinfection of Water Storage Facilities C652-92 states that the water storage facility shall be removed from service and isolated from the system prior to the inspection. Removing the facility from service prevents any contamination from entering the water system and allows the storage facility to be decontaminated, if necessary, before being returned to service. An exception is made if special conditions require underwater inspection without isolation. In that case, the underwater inspection should be done only when water flow into or out of the water storage facility are minimal. Furthermore, if a facility has a common inlet and outlet pipe, a positive flow into the facility should be maintained during the dive.

The Program recommends that storage facilities be capable of being isolated from the system. Eventually each metal storage facility must be taken out of service for an extended time to be sandblasted and painted. Furthermore, damage and contamination can occur to the water storage facilities that require them to be removed from service as an emergency. Thus, the necessary equipment must operate properly to remove each storage facility from service and still maintain water service. This requires that this equipment be exercised routinely and that the system operators be familiar with the necessary procedures. This is an important part of the emergency plan required for each water system by 10 CSR 60-12.010.

In the event that it is determined it is necessary to clean and inspect the water storage facility online, the following precautions should be taken:

1. Raise the free chlorine residual to 2.0 mg/l prior to initiating cleaning and inspection by the addition of hypochlorite.
2. Monitor free chlorine residuals at least every two hours, or more frequently, as necessary to ensure free chlorine residuals remain above 0.5 mg/l. Add sufficient hypochlorite at the end of

each interval to raise the free chlorine residual to 2.0 mg/l.
3. Have a public water system official in communication with the water department and have the fire department standing by to warn the diving contractor of a fire or other significant event that could result in a rapid water level change in the storage facility.
4. If the sediment depth is found to be greater than six inches or if the sediment contains bird, insect or animal parts, the tank must be taken out of service and cleaned or inspected by the traditional dry inspection procedure.
5. At the completion of cleaning/inspection, raise the free chlorine residual to 2.0 mg/l and collect a bacteriological sample.
6. If the bacteriological sample result is unsafe or questionable, disinfect and flush the entire system within 24 hours of receiving the test results.

Water Quality

With the storage facility taken out of service, tests on the water in storage for free chlorine or chloramine residuals must be made before and after the facility is inspected. If the residuals drop during the inspection, it suggests that contamination has occurred and decontamination actions may be needed before the facility is returned to service. A minimum free chlorine residual of 0.5 mg/l or a minimum chloramine residual of 1.0 mg/l should exist after the inspection and cleaning operation is completed. If the water system does not normally disinfect the water or if minimum residuals are not available before the inspection, chlorine should be added to obtain the necessary residuals. However, total chlorine residuals should not exceed 4.0 mg/l.

If the recommended disinfection residuals are provided in the water after the inspection, a bacteria analysis of the stored water prior the returning the facility to service should not be necessary. However, the Program encourages collecting bacterial samples before and after returning the facility to service as an additional indicator of water quality.

When surface water plant clearwells or ground storage tanks are inspected and cleaned, turbidity analyses should be done in addition to disinfectant residual analyses. Do not release water that exceeds 0.5 NTU turbidity to the water system.

Boil Water Notice

Unless low pressures occurred in the water distribution system during the inspection or unsafe bacteria sample results are obtained after the facility has been returned to service, a boil water notice is not required.

For more information

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